Pergamon

Mechanics Research Communications, Vol. 22, No. 4, pp. 407-414, 1995

0093-6413/95 $9.50 + .00

0093-6413(95)00043-7

THE EXACT SOLUTION OF THE PLANE ELASTICITY PROBLEM FOR THE S-CRACK.

Shirokova E.A.
Department of Mechanics and Mathematics, Kazan University, Kazan, 420008, Russia

(Received 13 February 1995; accepted for print 24 April 1995)

Introduction.

The plane elasticity problem for loaded surface is reduced to the boundary value problem for the analytic function with known singularities. The method is available for the wide class of internal holes.

Analysis.

The elasticity first basic problem [1] for an unbounded domain D can be reduced to finding two analytic functions

$$F(z)=\Gamma-\frac{X+iY}{2\pi(1+k)z}+\frac{a}{z^2}+\dots,G(z)=\Gamma'+\frac{k(X-iY)}{2\pi(1+k)z}+\frac{a'}{z^2}+\dots,z\in D,\quad (1)$$

Γ and Γ' beeng known ($\mathrm{Im}\Gamma=0$). The boundary condition is

$$F(z)+\overline{F(z)}+e^{-2i\arg z'(t)}[z\overline{F'(z)}+\overline{G(z)}]=T_n(t)-iT_s(t),\qquad (2)$$

here $z=z(t)$, $t\in[0,1]$, is the equation of the boundary curve ∂D.

$$X+iY=-\int_0^1[T_s(t)+iT_n(t)]z'(t)dt.\qquad (3)$$

We transfer to the function $z(\zeta)$, which maps conformly $E^-=\{\zeta=\xi+i\eta,|\zeta|>1\}$ on D with the correspondence $z(\infty)=\infty$, [2]. So the